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No, We Are Not in a Cometary Shower

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The flux of long-period comets through the planetary region will vary as a result of the magnitude and rate of external perturbations on the Oort cloud. In extreme cases, star passages through the Oort cloud or encounters with GMC's can cause showers of 10^9 or more comets to enter the planetary system (Hills, J. G., *Astron. J.* **86**, 1730, 1981). In order to correctly estimate the population of comets in the Oort cloud, it is necessary to know whether or not the solar system is currently experiencing an enhanced cometary flux. In addition, cometary showers have been invoked to try and explain the enhanced cratering rate currently estimated for the Earth over the past 250 Myr, which is about twice that estimated for the Moon over the past 3 Gyr. Using computer-based dynamical simulation models, it is shown that the current distributions of long-period comet orbital elements are inconsistent with a cometary shower. Two different dynamical tests are employed. First, it is shown that the predicted orbit element distributions from a cometary shower are highly non-random, in contrast with the random distributions of the long-period comets. Second, the $1/a_0$ distribution for the long-period comets shows no evidence of a perturbation of the inner Oort cloud, as would be expected for a major cometary shower. Taken together, these two tests allow one to set an upper limit on the magnitude of any recent major perturbations on the Oort cloud. This work was supported by the NASA Planetary Geology and Geophysics Program.

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